BioE 439/539: Applied Statistics for Bioengineering and Biotechnology

Fall 2016

Course Description:

This semester-long course aims to provide an introduction to statistics and statistical analysis, with emphasis on application to data generated from biomedical and biotechnological experiments. After completion of the course, students will be able to use statistics as an analytic tool for describing data, testing hypotheses, designing experiments, and critically evaluating conclusions.

Meeting Time & Location:

TTh 9:25am - 10:40 am, Location BRC 284

Course Instructors

Dr. David Zhang — BRC Room 425
dyz1@rice.edu — Office Hours: by appointment

Teaching Assistants
Sherry Wang — BRC Room 403
jw51@rice.edu — Office Hours: by appointment

Method of Instruction

This class will contain lectures, 10 optional problem sets as homework, a midterm, and a final exam. Both the midterm and the final exam are take-home. Coursework will cover both material from listed textbooks as well as material from lectures. Please bring your Matlab-installed laptop whenever you attend class.

BioE 539 additional requirements: Additional problems will be assigned for both problem sets and for midterm/final.

Course Information:

Course information, including problem sets and example solution sets, can be found at the course website: http://nablab.rice.edu/bioe439/

Course Readings

There is no required textbook for the course. Online lecture notes cover all necessary materials. For reference, students may optionally consult:

1. "Biostatistics," 10th edition, by Wayne Daniel and Chad Cross, published by Wiley.

Grading Criteria:

Students will be graded according to one of two criteria, whichever produces a more favorable grade for the student.

Option 1:

Problem Sets	20%
Midterm Exam	32%

Final Exam 48%

Option 2:

Midterm Exam 40%
Final Exam 60%

Problem Sets:

Problem sets are due at the beginning of class, at 10:50am, on the due dates. As the problem sets are optional for the course grading, **no late problem sets** will be accepted. You may turn in your problem sets either physically in paper, or email them to your TA.

Grading Disputes:

If you believe that a mistake has been made in grading your problem sets or exams, please first consult your TA. If you cannot reach satisfactory resolution with your TA, you may appeal to Dr. Zhang, but be warned that a failed appeal will result in **a grade penalty** of -5% on the relevant problem set or exam.

Honor System Policy:

Students are expected to adhere to the Honor Code and follow the guidelines given in the Blue Book. Exams are given under the honor system. Students are encouraged to bring any concerns involving academic integrity to the attention of the instructor. More information can be found at honor.rice.edu

Schedule:

Tues 8/23	1: Matlab refresher; Probability	
Thurs 8/25	2: Descriptive Statistics	
Tues 8/30	3: Sampling from Data	
Thurs 9/1	4: Sensitivity and Specificity	PS 1 out
Tues 9/6	5: Receiver Operator Curves (ROC)	
Thurs 9/8	6: Analog Tests and Predictions	PS 1 due, PS 2 out
Tues 9/13	7: Linear and Polynomial Fits	
Thurs 9/15	8: Stock Market Data	PS 2 due, PS 3 out
Tues 9/20	9: Multiple Linear Fits and Numerical Optimization	
Thurs 9/22	10: Arbitrary Fits and Numerical Optimization	PS 3 due, PS 4 out
Tues 9/27	11: Arbitrary Fits and Numerical Optimization	
Thurs 9/29	12: Training and Test Sets	PS 4 due, PS 5 out
Tues 10/4	13: Gaussian Distribution and Parameter Estimation	
Thurs 10/6	14: Midterm Review	PS 5 due, MIDTERM EXAM out
Tues 10/11	NO CLASS (Institute: Midterm break)	
Thurs 10/13	15: Central Limit and Confidence Intervals	MIDTERM EXAM due,
Tues 10/18	16: Mean Standard Deviation and t-Distribution	
Thurs 10/20	17: t-Distribution and Hypothesis Testing	PS 6 out
Tues 10/25	18: Two-way t-Tests	
Thurs 10/27	19: Two-way t-Tests	PS 6 due, PS 7 out
Tues 11/1	20: Chi Squared Distribution	
Thurs 11/3	21: Chi Squared Distribution	PS 7 due, PS 8 out
Tues 11/8	22: Analysis of Variance	
Thurs 11/10	23: Analysis of Variance	PS 8 due, PS 9 out
Tues 11/15	24: Analysis of Variance	
Thurs 11/17	25: Nonparametric and Distribution-Free Statistics	PS 9 due
Tues 11/22	26: Nonparametric and Distribution-Free Statistics	
Thurs 11/24	NO CLASS (Institute: Thanksgiving day)	
Tues 11/29	26: Final Exam Review	FINAL EXAM out
Thurs 12/1	NO CLASS	
Tues 12/6	NO CLASS	FINAL EXAM due